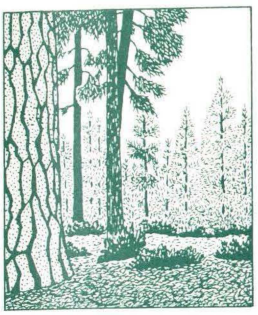
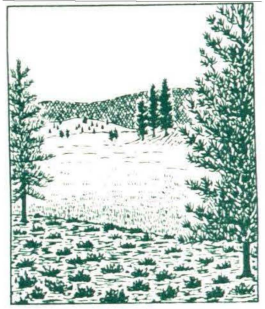


FOREST RESEARCH NOTES

CALIFORNIA FOREST AND RANGE EXPERIMENT STATION
KEITH ARNOLD, DIRECTOR

U.S. DEPARTMENT OF AGICULTURE – FOREST SERVICE



INTERMOUNTAIN STATION
Central Reference File
No. 0.73

No. 143

August 1958

HOT WATER BATH AND THIOUREA BREAK DORMANCY OF WEDGELEAF CEANOTHUS SEED[1/]

Richard L. Hubbard, Range Conservationist,
Division of Range Management Research

OCT 13 1958

Reseeding run-down deer ranges to browse species is at best a slow, expensive process. Success depends on the satisfactory handling of several details, such as removing competing vegetation, preparing a firm seedbed, and sowing highly viable seed of a good species that will cover easily and germinate readily. Many acres burned over by wildfire have remained unproductive or reverted to undesirable plants for lack of suitable seed than can be sown by airplane.

Wedgeleaf ceanothus (Ceanothus cuneatus) is a small-seeded species well suited to aerial seeding, and it provides desirable browse on deer ranges. The seed won't germinate, though, unless stratified or chemically treated--a common characteristic of western browse species. Until making the tests reported here, we didn't know how to get good germination quickly with wedgeleaf ceanothus. Now we've found a technique that promises to make reseeding of this species possible.

METHODS

Starting with dry seed and thiourea, a chemical known to be effective against dormancy in bitterbrush (Purshia tridentata)seed,[2/] three soaking treatments were set up (table 1). The same three thiourea treatments were used, too, on seed that had been through a hot water bath. Finally, two check lots of seed were set up--one with the hot water bath only, the other without either treatment--making a total of eight treatments.

1/ Contribution from cooperative investigation between the California Forest and Range Experiment Station and the California Department of Fish and Game. Work was done under Federal Aid in Wildlife Restoration Act, Pittmen-Robertson Research Project W51R, entitled "Game Range Restoration."

2/ Pearson, Bennett O. Bitterbrush seed dormancy broken with thiourea. Jour. Range Mangt. 10:41-42. 1957.

The California Forest and Range Experiment Station is maintained at Berkeley in cooperation with the University of Calif

CENTRAL FILE COPY

The hot water bath consisted of placing the seed in boiling water and leaving it there until the water cooled to 76°F. All thiourea treatments were straight soaking periods in a 3 percent solution.

Table 1.--Hot water and thiourea treatments

Treatment number	Hot water bath	Time soaked in 3 percent thiourea
1	Yes	4
2	Yes	13
3	Yes	24
4	Yes	None
5	None	4
6	None	13
7	None	24
8	None	None

After treatment, the seed lots were air dried for 6 days and then placed in petri dishes to germinate. Fifty seed per dish and 750 per treatment made up the randomized block design (fig. 1).

One-sixteenth inch of radicle growth was chosen as the criterion of germination. Germinated seed were tallied daily, then removed and planted in moist sand to determine the nature of seedling development. About two-thirds of these developed healthy seedlings.

RESULTS

Only the combinations of the water bath and thiourea soaking gave any appreciable germination. Hot water plus 13 hours soaking in 3 percent thiourea was best; hot water plus 24 hours, intermediate, and hot water plus 4 hours, poorest (table 2). In the other seed lots germination was very low--only 2 to 5 seed per lot.

Unfilled seed accounted to some extent for the low germination even under the best treatments. All ungerminated seed were cut to determine their soundness. By this test 24 to 33 percent of the seed selected were unfilled.

Two interesting sidelights were revealed during the study. First, germination began at one end of the laboratory table (fig. 1) 3 days earlier than at the other. This difference was traced to a 5 degree temperature difference--79.2°F. average maximum temperature versus 74.4°F. on the cool end. The lag showed up again at the end of the test as a greater than expected variance between blocks.

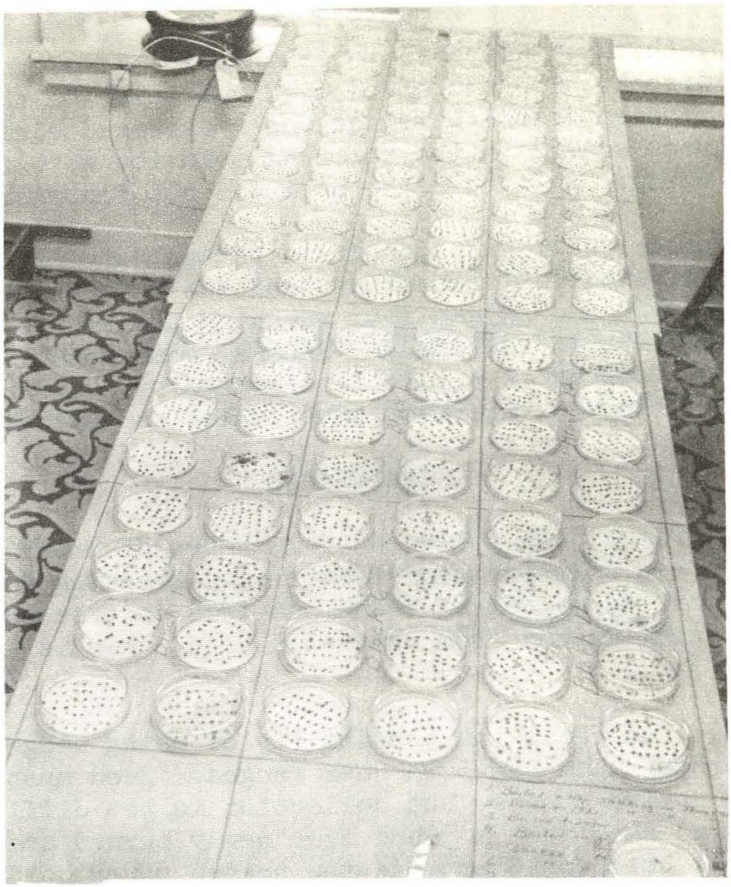


Figure 1.--Randomized block study of seed dormancy in Ceanothus cuneatus.

Table 1.--Germination of Ceanothus cuneatus seed treated with hot water bath and thiourea

Treatment	Filled seed in test	Seed germinated	Germination
	Number	Number	Percent
Hot water plus 4 hours in 3 percent thiourea solution	501	88	17.6
Hot water plus 13 hours in 3 percent thiourea solution	558	172	30.8
Hot water plus 24 hours in 3 percent thiourea solution	573	153	26.7

Second, thiourea appeared to inhibit the development of fungi in the petri dishes. The untreated seed got moldy on the second day of the test. Those treated with hot water appeared clean for about a week, but those soaked in the thiourea solution were free of fungi for nearly 3 weeks. Even then the mold did not flourish.

The double treatment pays off in better germination for two reasons. First, wedgeleaf ceanothus seed has a waxy outer coating that prevents water and oxygen from reaching the embryo. The hot water bath removes this coating.3/ Second, some seed lots have an embryo dormancy3/ which in nature is overcome by overwintering in the soil. The thiourea treatment substitutes for overwintering.

CONCLUSIONS

The hot water bath followed by 13 hours of soaking in a 3 percent thiourea solution was effective in breaking dormancy of 31 percent of the wedgeleaf ceanothus seed so treated. Compared to zero germination from untreated seed, this is pretty good.

The test indicates the possibility of using wedgeleaf ceanothus to revegetate run-down deer ranges. Seed must be gathered from native stands, but collection is not difficult. Dropping treated seed from a plane over newly burned areas where ashes and loose soil would provide the needed cover holds some promise with this species. The 31 percent germination of treated seed could be offset somewhat by choosing a high rate of seeding.

3/ U. S. Forest Service. Woody plant seed manual. U. S. Dept Agr. Misc. Publ. 654, 416 pp., illus. 1948.